



TAN-350

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

Hiroyasu SAKA, et al.

Serial No.: 10/530,332

Group: 1755

Filed: April 5, 2005

Examiner: K. Group

FOR: SURFACE TOUGHENING METHOD OF CERAMICS AND A CERAMICS PRODUCT

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

DECLARATION UNDER 37 C.F.R. 1.132

Sir:

I, Hiroyasu SAKA, declare that:

1. I am one of the listed inventors of the above referenced United States Patent Application, Serial No. 10/530,332 and also am one of the inventors of U.S. Patent 6,884,386 corresponding to International Application WO 2002/2465

2. Further, I am a professor on the faculty of Engineering of Nagoya University, one of the assignees of the present application, and I am Chief Researcher of the project resulting in the subject application in which the listed co-inventors, Shouji Uchimura, Won

Jin Moon and Toshiro Ito, are junior researchers working under my direction as shown by the attached chart of Organization of Research (Exhibit 1).

3. The inventions claimed herein and disclosed in WO 2002/24605 and U.S. 6,884,386 are the result of my work as professor on the faculty of Engineering and as Chief Researcher. In that position I supervise the junior researchers in work to refine such inventions to be ready for patenting and marketing. In the event that any additional inventive material results from such refinement, the junior researchers working on any project are listed as co-inventors thereof. However, the underlying invention is that of myself, the Chief Researcher.

4. The present application, S.N. 10/530,332, was filed as Japanese Priority Application JP2002-300765 as an optimization of the process disclosed in Japanese Application JP2000-286422, the priority for WO 2002/24605 and U.S. 6,884,386, leading to the invention claimed herein. Without that optimization, the product as claimed herein would not be obtainable from the prior disclosure.

The attached Exhibit 2, System for Patent Right, summarizes this relationship. The product obtained herein and the product of WO 2002/24605, U.S. 6,884,386 are different in structure.

5. To show the difference in dislocation structure between

the ceramic product of the present invention and the ceramic product of WO 2002/24605, U.S. 6,884,386, samples of each product were examined by transmission electron microscope.

6. The attached transmission electron microscope images (Exhibit 3) show the dislocation structure of the ceramic product of the present invention having a uniformly distributed linear dislocation structure compared to the dislocation structure of the prior art reference WO 2002/24605, to which high temperature of 1000°C to 1600°C is applied. As clearly shown, the product of the present invention has "a uniformly distributed homogeneous linear dislocation structure" as specified in the present invention, whereas the product of the prior art reference WO 2002/24605 has a non-uniform, non-linear dislocation structure. Accordingly, the product of the present invention and the product of the prior art reference WO 2002/24605 are structurally different.

7. As shown by the prior art WO 2002/24605, U.S. 6,884,386 and JP 07-157362, it is the common practice to prepare toughened ceramic products by an annealing treatment at high temperatures, either in combination with an impact treatment, as in WO 2002/24605, U.S. 6,884,386, or by annealing through hot pressing alone as in JP 07-157362. It was not until the work of the Declarant herein as presented in the present invention, that it was considered to prepare a surface toughened ceramic product that is non-annealed

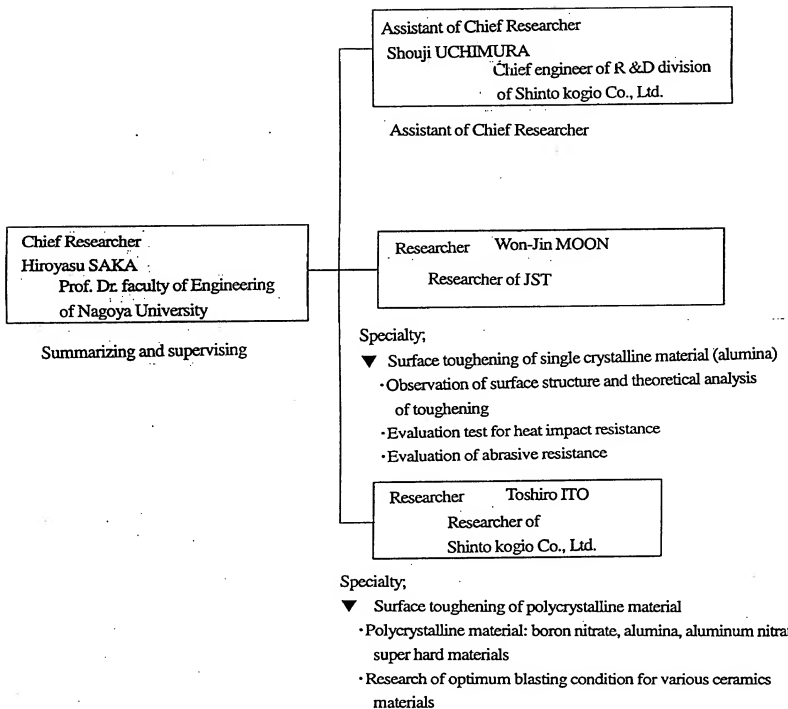
and that exhibits a uniformly distributed homogeneous linear dislocation structure in the subsurface regions within a depth direction of not more than 30 $\mu$ m from the most exterior surface.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 26. September 2007 Declarant: Hiroyasu Saka  
Hiroyasu SAKA

EXHIBIT 1

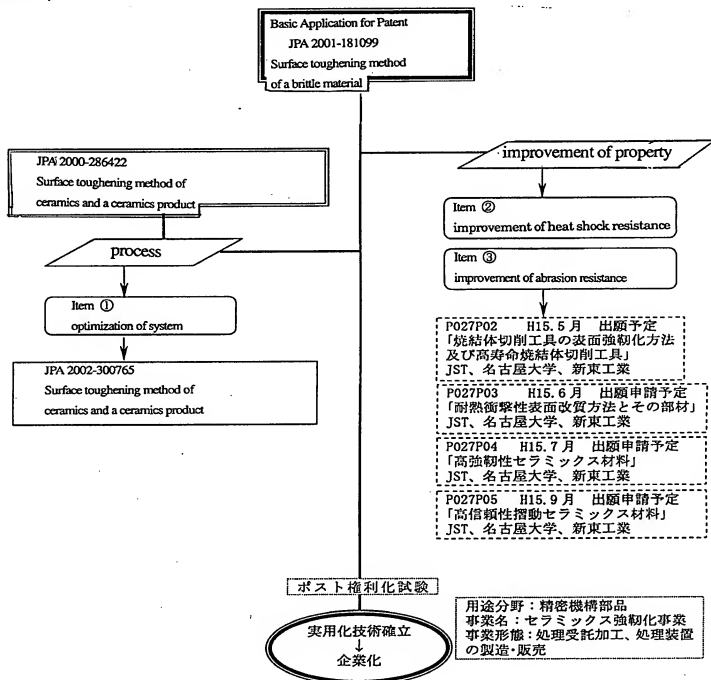
4 . Organization of Research



## 5. Results (Patents)

## (1) System for Patent right

Application referring a surface toughening process for ceramics by economical and effective shot peeling without accompanying heat treatment was filed (JPA 2002-300765) based on the basic patent application "Surface toughening method of a brittle material". Further, two relating applications are now being prepared aiming to expand the usage of ceramics by improvement of abrasion resistance and heat shock resistance ("Surface Toughening Method of a Sintered Material Cutting Tool and a Longlife Sintered Material Cutting Tool" and "Method of Surface Modification for Heat Shock Resistance and a Member Thereof").



# Difference of dislocation structure

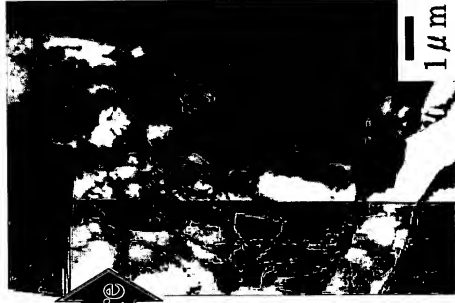
Invention Process



Linear dislocation  
(uniformly distributed)

Compare

Conventional Process



Non-linear dislocation  
(non-uniformly distributed)